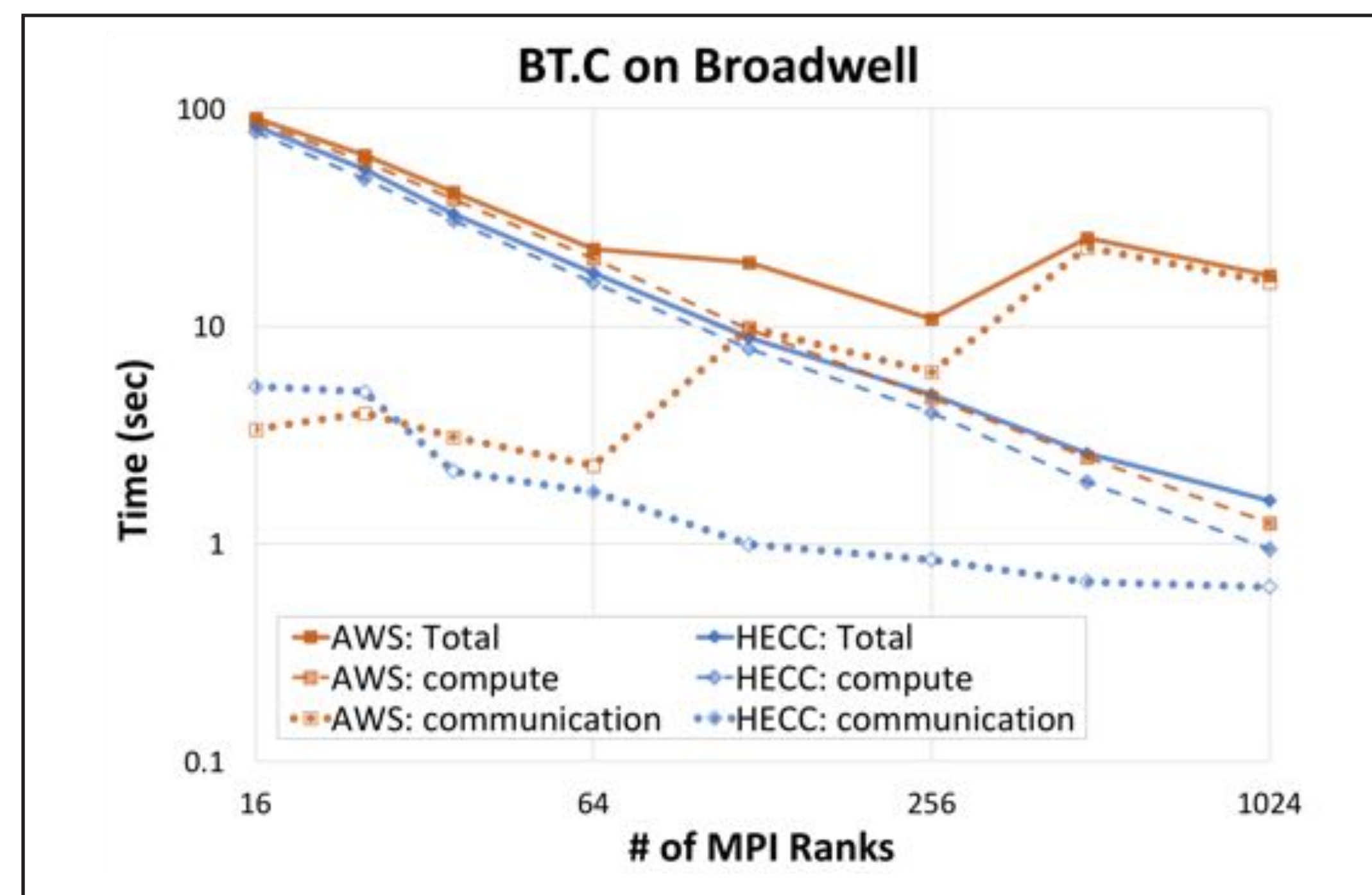
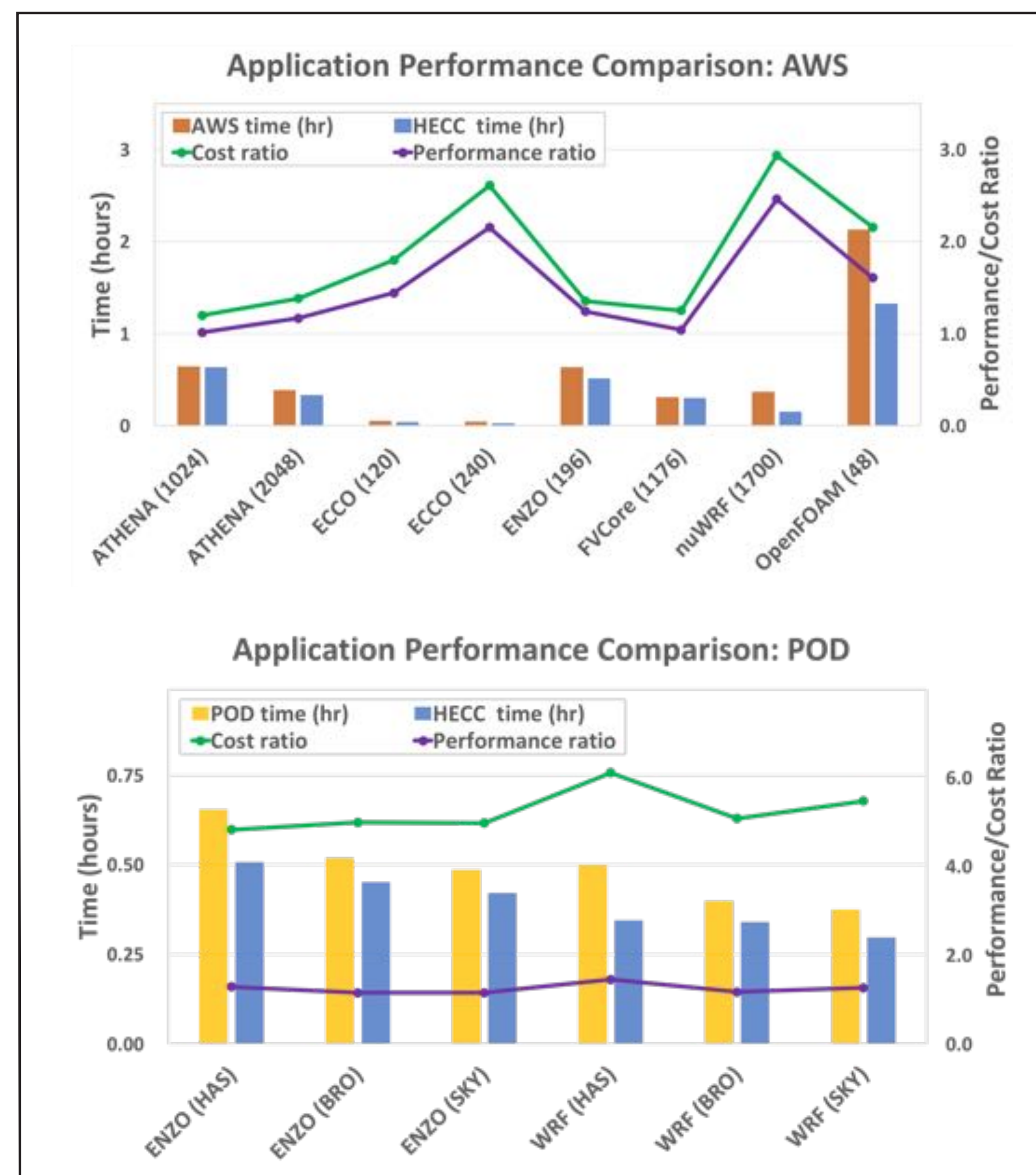


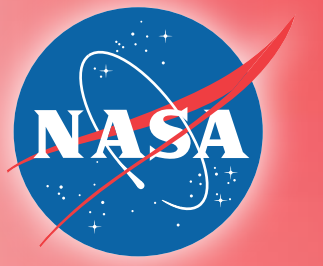
To evaluate scaling performance, the APP team used the NAS Parallel Benchmarks, which mimic computational fluid dynamics applications. This graph of the scaling behavior for the BT.C benchmark shows poor communication scaling on AWS—likely due to limitations of the 25-Gbps interconnect AWS used for inter-rank MPI communication across multiple nodes. The interconnects on POD were typical of those used on modern supercomputers; as a result, its performance (not shown) was fairly close to that of HECC. *Sherry Chang, Steve Heistand, NASA/Ames*



These two graphs show the relative performance and cost of running a production-representative suite of full applications in the cloud versus on HECC resources. The cost comparison uses an optimistic cost for clouds (compute only) and a pessimistic cost for HECC (total cost including staff, storage, and so on). Running the full suite was 1.9 times more expensive with AWS (using its spot pricing) than HECC and 5.3 times more expensive with POD (using its undiscounted rates) than HECC. *Sherry Chang, Steve Heistand, NASA/Ames*



National Aeronautics and Space Administration



# What Role Should Commercial Clouds Play in NASA HPC?

Every so often, the question arises: would it be more cost effective for NASA's High-End Computing Capability (HECC) Project to use commercial cloud resources? To find out, HECC's Application Performance and Productivity (APP) team undertook a performance and cost evaluation comparing three domains: two commercial cloud providers, Amazon Web Services (AWS) and Penguin Computing on Demand (POD), and HECC's in-house supercomputers. The study showed that while commercial clouds cannot compete on cost with the highly utilized HECC systems, they still have a place in providing access to resource types that would be otherwise unavailable. As a result, the team has implemented mechanisms to transfer some batch jobs to the cloud and is conducting a pilot study with users.



*Robert Hood, Henry Jin, NASA Ames Research Center*

**SUPERCOMPUTING**  
SCIENCE MISSION DIRECTORATE

www.nasa.gov